

Object-Oriented Programming Language

03/09/2023

Due 3/10 11:59AM

Lab Assignment 3

1. Write a program that inputs 3 triangles each with three vertices. Store them in an **array**, and then determine if the given triangles are right triangles (直角三角形). Here are some sample code you can use.

```
struct Vertex {  
    double x;  
    double y;  
};
```

```
struct Triangle {  
    Vertex A;  
    Vertex B;  
    Vertex C;  
    bool right;  
};
```

A sample run of the program is as follows:

```
Input for the 1 triangle:  
    Please input the x & y coordinates of the 1st vertex: 0 3  
    Please input the x & y coordinates of the 2nd vertex: 4 0  
    Please input the x & y coordinates of the 3rd vertex: 0 0  
Input for the 2 triangle:  
    Please input the x & y coordinates of the 1st vertex: 4 4  
    Please input the x & y coordinates of the 2nd vertex: 4 4  
    Please input the x & y coordinates of the 3rd vertex: 3 3  
Input for the 3 triangle:  
    Please input the x & y coordinates of the 1st vertex: 9 7  
    Please input the x & y coordinates of the 2nd vertex: 4 5  
    Please input the x & y coordinates of the 3rd vertex: 12 -5  
Done reading Triangles.  
Triangle 1 is a right triangle!  
The right angle of triangle 1 is at the Vertex3  
Triangle 2 is NOT a right triangle!  
Triangle 3 is NOT a right triangle!
```

2. Write a C++ program that inputs certain number of triangles each with three vertices. Store them in a **vector**, and then determine if the given triangles are right triangles (直角三角形). When you access the triangles in the vector, use **iterators**. You should also use the mentioned **struct** in problem 1.

```
How many Triangles will you input? 3
Input for the 1 triangle:
    Please input the x & y coordinates of the 1st vertex: 1 1
    Please input the x & y coordinates of the 2nd vertex: 1 -1
    Please input the x & y coordinates of the 3rd vertex: 0 0
Input for the 2 triangle:
    Please input the x & y coordinates of the 1st vertex: 1 1
    Please input the x & y coordinates of the 2nd vertex: 2 2
    Please input the x & y coordinates of the 3rd vertex: 0 1
Input for the 3 triangle:
    Please input the x & y coordinates of the 1st vertex: 1 1
    Please input the x & y coordinates of the 2nd vertex: 1 1
    Please input the x & y coordinates of the 3rd vertex: 1 1
Done reading Triangles.
Triangle 1 is a right triangle!
Triangle 2 is NOT a right triangle!
Triangle 3 is NOT a right triangle!
```

```
How many Triangles will you input? 2
Input for the 1 triangle:
    Please input the x & y coordinates of the 1st vertex: 1 1
    Please input the x & y coordinates of the 2nd vertex: 1 -1
    Please input the x & y coordinates of the 3rd vertex: 0 0
Input for the 2 triangle:
    Please input the x & y coordinates of the 1st vertex: 1 1
    Please input the x & y coordinates of the 2nd vertex: 1 1
    Please input the x & y coordinates of the 3rd vertex: 1 1
Done reading Triangles.
Triangle 1 is a right triangle!
Triangle 2 is NOT a right triangle!
```

3. Write a program that takes a (r x c) matrix as input and return the transpose of the matrix.

r,c <=10

A sample run of the program is as follows:

```
2 3
4 5 6
3 4 5

4 3
5 4
6 5
```

4. Write a program that input a string and test if it is a palindrome(回文)

You **can't** use the reverse() in the #include <algorithm>

(hint: input N character, compare the first and the N-th, second and the (N-1)-th and so on)

Some sample runs of the program are as follows:

```
abcba
yes

www
yes

abbbnnncaca
no
```

5. Write a program that input a number as a **string** and return its reverse

(hint: You can use reverse() in the #include <algorithm> and there is no '0' at the beginning but the end of the input number)

Some sample runs of the program are as follows:

```
76355200
255367

12345
54321
```

6. Write a program that input an arithmetic sequence's (等差數列) first number , last number and the common difference of successive members. Please return the whole arithmetic sequence.

Some sample runs of the program are as follows:

```
3 9 2
3 5 7 9
```

```
1 17 4
1 5 9 13 17
```

7. Write a program that input a number n and return a “cool” pyramid. For example, if n=3, first row has 1 * and 4_, second row have 3* and 2_, third row has only 5*. That is, creating a (2n-1) x(2n-1) matrix.

Some sample runs of the program are as follows:

```
6
      *
    ***
  *****
*****
*****
*****
*****
```

```
3
  *
 ***
*****
```

8. There is very simple encryption method in cryptography(密碼學) which is add a certain integer K to each character of the code to obtain the characters of the password For example, if K=2, then apple becomes crrng after encryption .Write a program that input a string and return a string after **encryption**.

Please use K=7

Some sample runs of the program are as follows:

```
I love OOP, OOP NO:1
P'sv}l'VVW3'VVW'UVA8
IBM is a trademark of the International Business Machine Corporation.
PIT'pz'h' {yhklthyr'vm' {ol'Pu{lyuh{pvuhs'I|zpulzz'Thjopul'Jvywvyh{pvu5
```

You can copy the sample input:

I love OOP, OOP NO:1

IBM is a trademark of the International Business Machine Corporation.

(HW_1). Write a program that input a number, return the factorization of the number
A sample run of the program is as follows:

```
please input a number
999997
757^1 * 1321^1
```

(HW_2). write a program that input a number as an **int** and return its reverse

You should use only `#include <iostream>`

(hint: use the “%” operator and there is no ‘0’ at the beginning but the end of the input number)

Sample runs are same to the question 5